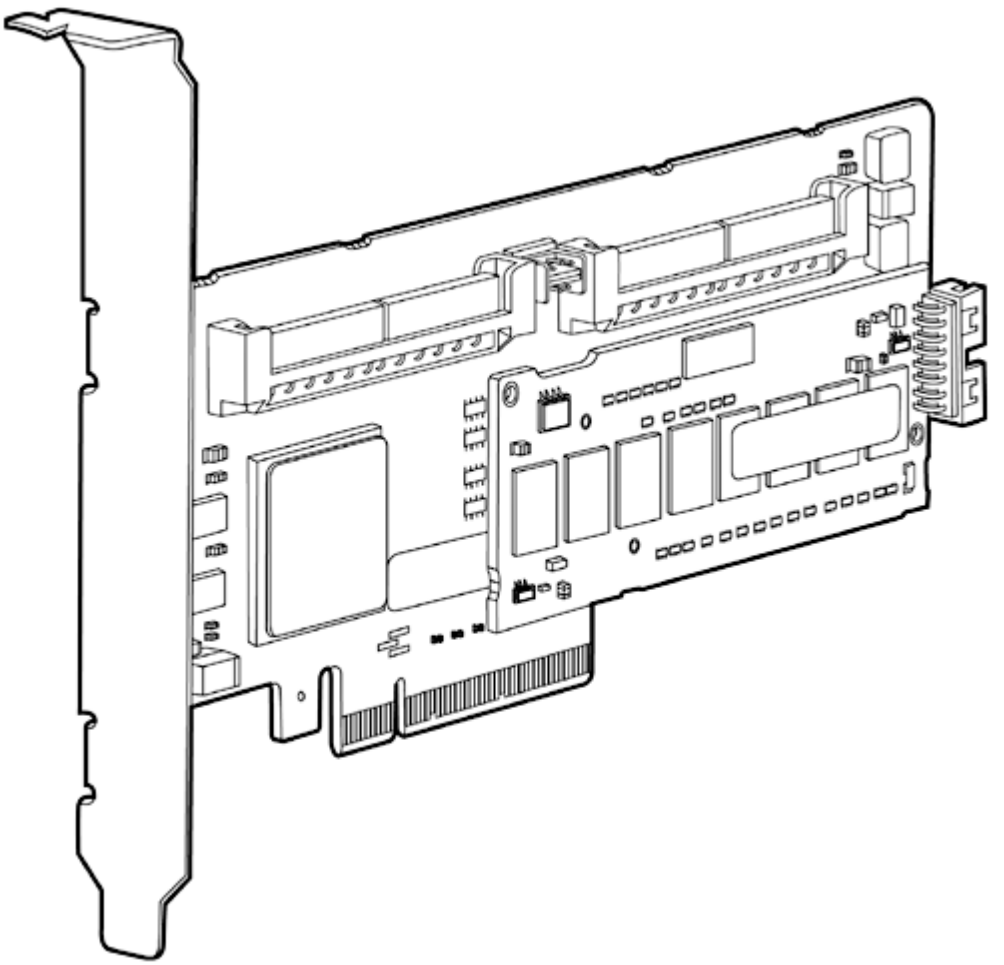
Overview

The HP Smart Array P400 is HP's first PCI-Express (PCIe) serial attached SCSI (SAS) RAID controller and provides new levels of performance and reliability for HP servers, through its support of the latest SCSI technology and advanced RAID capabilities.



Models

HP Smart Array P400 Controller	HP Smart Array P400/256MB Controller	405132-B21
	HP Smart Array P400/512MB Controller with BBWC	411064-B21

Overview

Upgrade Options

Battery Attach Kit	Smart Array P400 Battery Attach Kit NOTE: This option kit contains a 24" battery cable and adhesive material for installing a battery into the following servers if a Smart Array P400 is integrated outside of the factory - HP ProLiant ML310 G3, HP ProLiant ML310 G4, HP ProLiant DL320 G4, HP ProLiant ML350 G5, HP ProLiant DL380 G5 (installations in a full size slot), HP ProLiant DL385 G2 (installations in a full size slot) and HP ProLiant DL580 G4. For all solutions, please refer to the HP ProLiant QuickSpecs and User's Manual for detailed installation instructions.	417836-B21
Cache Upgrades	Battery-backed write cache upgrade	383280-B21
	512MB Battery-backed write cache upgrade	405148-B21

Standard Features

The Smart Array Advantage

HP's innovative design and integration work within the Smart Array family of products creates customer value that is unmatched in the industry. Use of Smart Array products across multiple applications results in a much lower Total Cost of Ownership (TCO) than any other server storage RAID product. The HP Smart Array family brings an unparalleled return on investment.

- Data Compatibility
- Consistent Configuration and Management Tools
- Universal Hard Drive
- Pre-Failure Warranty

Data Compatibility

Data Compatibility with past and future generations of Serial Smart Array controllers allows for simple and easy upgrades any time needs for higher performance, capacity, and availability increase.

Consistent Configuration and Management Tools

All Smart Array products utilize a standard set of management and utility software. These tools minimize Total Cost of Ownership (TCO) by reducing training requirements and technical expertise necessary to install and maintain HP server storage.

Universal Hard Drive

A universal hard drive is used across multiple HP ProLiant servers, disk enclosures and storage systems. With compatibility across many enterprise platforms, you are free to deploy and re-deploy these drives to quickly deliver increased storage capacity, migrate data between systems, and easily manage spare drives.

Pre-Failure Warranty

Pre-Failure Warranty means Systems Insight Manager not only reports when a drive is going to fail but allows replacement of failing drives prior to actual failure. For complete details, consult the HP Support Center or refer to your HP Server documentation.

Key Features

- The SA-P400 Controller supports up to 18 drives. The SA-P400i Controller supports up to 6 drives depending on the server implementation.
- Seamless upgrades from past generations and upgrades to next generation HP high performance and high capacity Serial Attached SCSI Smart Array controllers.
- 3G SAS technology delivers high performance and data bandwidth up to 300 MB/s per physical link and contains full compatibility with 1.5G SATA technology.
- x8 2.5G PCI Express host interface technology delivers high performance and data bandwidth up to 2 GB/s maximum bandwidth.
- Modular, easy-to-upgrade design lets you optimize performance by upgrading from 40-bit 256MB cache to 72-bit 512MB battery-backed write cache (BBWC).
- Addition of the battery backed cache upgrade enables BBWC, RAID 6 with ADG, array expansion, logical drive extension, RAID migration, and stripe size migration.
- Mix-and-match SAS and SATA hard drives, lets you deploy drive technology as needed to fit your computing environment.
- Software consistency among all Smart Array family products: Array Configuration Utility (ACU), Option ROM Configuration for Arrays (ORCA), Systems Insight Manager, Array Diagnostic Utility (ADU) and SmartStart.
- Support for up to 2TB in a single logical drive.
- Low-profile PCI Express form factor - ships with a full size bracket for deployment in either a low-profile or full sized slot.

Standard Features

Management Features

- Online array expansion (with BBWC upgrade)
- Online logical drive extension (with BBWC upgrade)
- Online RAID level migration (with BBWC upgrade)
- Online strip size migration (with BBWC upgrade)
- Offline Mirror splitting and recombining
- Unlimited global online spare assignment
- User selectable expand and rebuild priority
- User selectable RAID level and stripe size
- User selectable read and write cache sizes

Ports

- Eight (8) SAS physical links distributed across 2 internal x4 wide port connectors.

Performance

HP's High Performance Architecture sets new boundaries of industry performance expectations!

- 3G SAS (300MB/s bandwidth per physical link)
- x8 3G SAS physical links (compatible with 1.5G SATA)
- 256 MB 40-bit wide DDR2-533MHz cache upgradeable to 512 MB 72-bit wide DDR2-533MHz battery-backed cache provides up to 4.2 GB/s maximum bandwidth
- x8 2.5G PCI Express host interface provides 2 GB/s maximum bandwidth
- 440 PowerPC Processor
- Read ahead caching
- Write-back caching (with battery-backed write cache upgrade)

Capacity

Given the increasing need for high performance and rapid capacity expansion, the SA-P400 Controller offers:

- Up to 2TB of total storage with SATA HDD
- Up to 13.5TB of total storage with 18 x 750GB 3.5" SATA HDD

Availability

Provides increased server uptime by providing advanced storage functionality:

- Online RAID level migration (between any RAID level)
- Online stripe size migration
- Online array expansion
- Online logical drive extension
- Online drive firmware upgrade
- Unlimited global online spare
- Pre-Failure Warranty

Standard Features

Fault Prevention

The following features offer detection of possible failures before they occur, allowing preventive action to be taken:

- S.M.A.R.T.: Self Monitoring Analysis and Reporting Technology first developed at HP detects possible hard disk failure before it occurs, allowing replacement of the hard drive before a real failure occurs.
- Drive Parameter Tracking monitors drive operational parameters, predicting failure and notifying the administrator.
- Dynamic Sector Repairing continually performs background surface scans on the hard disk drives during inactive periods and automatically remaps bad sectors, ensuring data integrity.
- Smart Array Cache Tracking monitors integrity of controller cache, allowing pre-failure preventative maintenance.

Fault Tolerance

Keeps data available and server running while a failed drive is being replaced; several fault tolerance configurations are supported including:

- RAID 6 with ADG (Advanced Data Guarding): This is the highest level of fault tolerance. It allocates two sets of parity data across drives and allows simultaneous write operations. This level of fault tolerance can withstand two simultaneous drive failures without downtime or data loss.
- RAID 5 (Distributed Data Guarding): This allocates one set of parity data across drives and allows simultaneous write operations. This level of fault tolerance can withstand a single drive failure without downtime or data loss.
- RAID 1, 1+0 (Drive Mirroring): This allocates half of the drive array to data and the other half to mirrored data, providing two copies of every file. It is a high-performance RAID.

Fault Recovery

Minimizes downtime, reconstructs data, and facilitates a quick recovery from drive failure

- Recovery ROM: This feature protects the user from a firmware image corruption by storing a redundant copy of the firmware image. If the active firmware image becomes corrupt, the controller will use the redundant firmware image and continue operating.
- On-Line Spares: There is no limit to the number of spare drives that can be installed prior to drive failure. If a failure occurs, recovery begins with an On-Line Spare and data is reconstructed automatically.
- DRAM ECC detects and corrects data bit errors.
- Battery-backed write cache upgrade provides for up to two days of battery power for data cache retention. The data backup duration could be extended anytime the server's auxiliary power is available during system power down.

Ease of Use

Consistency and Upgradeability make the Smart Array family unique in the industry:

- GUI based configuration, management and diagnostic software tools
- Common data format between generations of products
- Data migration between servers and external StorageWorks Modular Smart Array enclosures

Compatibility

Servers

For up to date compatibility, please see the following URL for complete Smart Array P400 Controller compatibility and support information:
http://h18006.www1.hp.com/products/servers/proliantstorage/arraycontrollers/index.html

Operating Systems

Microsoft® Windows™ 2000 Server
Microsoft Windows 2000 Advanced Server
Microsoft Windows 2003 / R2 Standard Edition
Microsoft Windows 2003 / R2 Enterprise Edition
Microsoft Windows 2003 / R2 Standard x64 Edition
Microsoft Windows 2003 / R2 Enterprise x64 Edition
Microsoft Windows 2003 / R2 SBS
Novell Open Enterprise Server, NetWare 6.5 SP5
Red Hat Enterprise Linux 3 (AMD64/EM64T)
Red Hat Enterprise Linux 3 (x86)
Red Hat Enterprise Linux 4 (AMD64/EM64T)
Red Hat Enterprise Linux 4 (x86)
SUSE LINUX Enterprise Server 9 (AMD64/EM64T)
SUSE LINUX Enterprise Server 9 (x86)
SCO OpenServer 5.0.7, 6
SCO UnixWare 7.1.3, 7.1.4
Solaris 10
VMWare ESX 3.0

Software Suite

All Smart Array products share a common set of configuration, management and diagnostic tools, including Array Configuration Utility, Array Diagnostic Utility (ADU), and Systems Insight Manager. This software consistency of tools reduces the cost of training for each successive generation of product and takes much of the guesswork out of troubleshooting field problems. These tools lower the total cost of ownership by reducing training and technical expertise necessary to install and maintain HP server storage.

Systems Insight Manager

- Powerful server and server options/storage manager tool
- Monitors over 1200 system wide parameters
- Configuration/Diagnostic Utilities

HP Array Configuration Utility (ACU)

- Powerful Web based configuration utility for all Smart Array controllers
- Provides a graphical view of HP drive array configurations
- Allows for management of multiple arrays over a secure internet connection from anywhere in the world
- Easy to use Wizards for configuration
- Runs offline for all supported Operating Systems and runs online for Windows and Linux. For online configuration of NetWare, use CPQONLIN

HP Option ROM Configuration for Arrays (ORCA)

Compatibility

- A simple method for managing logical drives during system power up by pressing F8 during POST
- Allows the ability to create arrays, logical drives, and assign an online spare drive
- Allows the ability to view and delete logical drives
- Allows the ability to select the boot controller
- For advanced array configurations use ACU

HP Array Diagnostic Utility (ADU)

- In depth diagnostic and reporting utility for all Smart Array controllers
- Runs offline for all supported Operating Systems, and runs online for Windows and Linux

Service and Support, HP Care Pack, and Warranty Information

Warranty	The warranty for this device is 3-years parts only. **Pre-Failure Warranty:** Drives attached to the Smart Array Controller and monitored under Insight Manager are supported by a Pre-Failure (replacement) Warranty. For complete details, consult the HP Support Center or refer to your HP Server Documentation.
Software Product Services	Standalone telephone support Rights to new license version Media and documentation updates
Hardware Product Services	Installation services On-site maintenance (includes warranty support) Response time upgrades during the warranty period Post-warranty coverage For additional hardware installation and maintenance information, please refer to the URL listed below: http://www.hp.com/hps/hardware/
Warranty Upgrade Options	Response - Upgrade on-site response from next business day to same day 4 hours Coverage - Extend hours of coverage from 9 hours x 5 days to 24 hours x 7 days Duration - Select duration of coverage for a period of 1, 3, or 5 years Warranty upgrade options can come in the form of Care Packs, which are sold at the HP System level this product attaches too.
HP Care Pack Information	HP Care Pack is defined as an upgrade to the product warranty attribute, available for a specific duration and hours of coverage. Care Packs for this option is sold at the system level this option attaches too. HP Care Pack is not available for less than the product's warranty duration. HP Care Pack is available for sale anytime during the warranty period for most products, but the commencement date will be the same as the Warranty Start Date (delivery date to end user customer). Proof of purchase may be required. HP Care Pack services are prepaid. For additional HP Care Pack (hardware & software) information, as well as orderable part numbers, please refer to the URL http://www.hp.com/hps/carepack/

Related Options

Hard Drives	Serial Attached SCSI (SAS) SFF Hot Plug	
	HP 36GB 3G SAS 10K SFF SP HDD	375859-B21
	HP 72GB 3G SAS 10K SFF SP HDD	375861-B21
	HP 146GB 3G SAS 10K SFF SP SP HDD	431958-B21
	SAS Hot Plug	
	HP 36GB 3G SAS 15K 3.5" SP HDD	375868-B21
	HP 72GB 3G SAS 15K 3.5" SP HDD	375870-B21
	HP 146GB 3G SAS 15K 3.5" SP HDD	375872-B21
	HP 300GB 3G SAS 15K 3.5" SP HDD	431944-B21
	Serial-ATA (SATA) SFF Hot Plug	
	HP 60GB 1.5G SATA 5.4K SFF HDD	379306-B21
	SATA Hot Plug	
	HP 80GB 1.5G SATA 7.2K 3.5" HDD	349237-B21
	HP 160GB 1.5G SATA 7.2K 3.5" HDD	349238-B21
	HP 250GB 1.5G SATA 7.2K 3.5" HDD	349239-B21
	HP 500GB 1.5G SATA 7.2K 3.5" HDD	395473-B21
	HP 750GB 1.5G SATA 7.2K 3.5" HDD	432341-B21
	SATA Non-Hot Plug	
	HP 250GB 1.5G SATA 7.2K NHP 3.5" HDD	411276-B21
	HP 160GB 1.5G SATA 7.2K NHP 3.5" HDD	411275-B21
	HP 80GB 1.5G SATA 7.2K NHP 3.5" HDD	383410-B21

NOTE: Go to the HP Hard Drive Compatibility table for complete drive compatibility information (http://www.hp.com/products/harddiskdrives). Using hard drives in unsupported configurations will result in voiding the warranty and could result in damage to the drive and/or loss of data.

NOTE: There is a known compatibility issue with some early 3.5" SATA HDD that will make them unable to be used with the SA-P400 controller. Customers should verify that they are not using hard drive part number 332649-002/003 (spare 353042-001), 332650-002/003 (spare 353043-001), or 356536-002/003 (spare 353044-001).

NOTE: SATA Drive Write Cache is disabled by default to minimize the risk of data loss in case of power loss and cannot be enabled for SATA drives attached to all HP Smart Array controllers and HP 8 Port internal SAS/SATA HBA with RAID.

Technical Specifications

Dimensions (not including bracket)	Low Profile PCIe Form Factor 6.61 in x 2.75 in x 0.7 in (16.8 cm x 7.0 cm x 1.8 cm)
Disk Drive and Enclosure Interface	3G SAS (Serial Attached SCSI) 1.5G SATA (Serial ATA)
SAS Connectors	2 internal (SFF8484) x4 wide port connectors
Cache Memory Speed	DDR2-533MHz with 40 or 72-bit wide bus provides up to 4.2 GB/s maximum bandwidth.
Server Interface	x8 2.5G PCIe provides 2GB/s maximum bandwidth.
SAS Speed	x8 3G SAS provides 2.4GB/s maximum bandwidth.
Cache Memory	40-bit 256MB ECC protected cache (72-bit 512MB module upgrades available); transportable with battery-backed upgrade
Logical Drives Supported	Up to 32 logical drives
Maximum Logical Drive Capacity	2TB
Host Memory Addressing	64-bit, supporting greater than 4GB server memory space
RAID Support	RAID 6 with ADG (Advanced Data Guarding) requires Battery Backed Write Cache Upgrade RAID 5 (Distributed Data Guarding) RAID 1+0 (Striping & Mirroring) RAID 0 (Striping)
Upgradeable Firmware	Upgradeable Firmware with recovery ROM feature

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For hard drives, 1 GB = 1 billion bytes. Actual formatted capacity is less.